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Briefing Report to the Chairman, Subcommittee on Defense, Committee on Appropriations, House of Representatives

September 1986

CARRIER LANDING SYSTEMS

Replacement of the Navy's Automatic Landing System May Be Premature

ORIGINAL

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The Honorable Bill Chappell, Jr.
Chairman, Subcommittee on Defense
Committee on Appropriations
House of Representatives

Dear Mr. Chairman:

In a January 28, 1986, letter, former Chairman Joseph P. Addabbo asked us to review the Navy's plan to replace the AN/SPN-42 automatic carrier landing system (ACLS) with a new AN/SPN-46 ACLS. This letter summarizes our observations, and appendix I more fully discusses the issues.

An ACLS provides the capability to control aircraft during their final approach and landing aboard a carrier. If problems exist with this system or aircraft related subsystems, pilots cannot attempt to land their airplane using the automatic mode.

The percentage of completed automatic landings with the current system (AN/SPN-42) has been and continues to be low. This is primarily because of problems with aircraft ACLS related subsystems, rather than the ship-board ACLS the Navy plans to replace. Thus, replacement of the ACLS is not expected to significantly increase automatic landing completion rates.

The Navy's justification for the new system is improved operational availability, mean time between failures, and mean time to repair. However, testing has been insufficient to fully establish the new system's performance in these areas and its readiness for production. Navy officials told us that testing should be completed and evaluated by May 1987 and the results would be used for a full production decision for fiscal year 1988.

The Navy plans to acquire 25 systems--5 to be bought with ship construction, Navy (SCN) funds for new carriers and 20 with other procurement, Navy (OPN) funds to replace existing ACLSs. The Navy has already bought three systems with SCN funds and plans to buy the first three OPN-funded systems early in fiscal year 1987 under a limited production contract. As planned, this contract would be awarded before operational tests are completed and evaluated.

The procurement of the three OPN-funded ACLS (AN/SPN-46) systems could be premature because testing has not demonstrated that its operational availability, mean time between failures, and mean time to repair will be better than those of the existing system (AN/SPN-42). Therefore, your Committee may want to delete the Navy's fiscal year 1987 budget request of $23 million to acquire three ACLSs.

At a meeting on August 20, 1986, Department of Defense (DOD) officials provided comments on our briefing report. Their comments have been incorporated into our report. Essentially, the officials said that our report overstated the operational availability of the current ACLS, that a delay in procurement of the three units in fiscal year 1987 will cause a delay in installation of the system on two carriers, and that the Navy is considering improvements to aircraft subsystems that are the primary cause of low automatic landing completion rates. In addition, the officials disagreed with our conclusion that further procurement of the new ACLS is premature.

We have considered DOD's comments in preparing this briefing report and have modified it to reflect that the Navy is considering additional improvements to aircraft ACLS-related subsystems. However, the information furnished by DOD does not change our conclusion that further procurement of the AN/SPN-46 should be delayed until its full production which is scheduled to begin in fiscal year 1988. This will allow formal operational testing by the Navy to validate the system's operational suitability before further production.

Unless you publicly announce its contents earlier, we plan no further distribution of this briefing report until 10 days from the date of this letter. At that time we will send copies to interested parties and make copies available to others upon request. If you have questions, please call Richard Davis, Associate Director, at 275-4841.

Sincerely yours,

Frank C. Conahan

Frank C. Conahan
Assistant Comptroller General

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ABBREVIATIONS

ACLS	automatic carrier landing system
DOD	Department of Defense
OPN	other procurement, Navy
OPTEVFOR	Operational Test and Evaluation Force
SCN	ship construction, Navy

ACLS: REPLACEMENT MAY BE PREMATURE

CHART I.1: OBJECTIVES, SCOPE, AND METHODOLOGY

We reviewed the Navy's ACLS to determine

--why the current ACLS does not work well,

--whether the new ACLS is likely to provide improved reliability and maintainability, and

--the impact the new ACLS will have on automatic landing performance.

We interviewed officials at the

--Chief of Naval Operations, Washington, D.C.;

--Naval Air Systems Command, Washington, D.C.;

--Space and Naval Warfare Systems Command, Washington, D.C.;

--Naval Electronics Systems Engineering Activity, Maryland;

--U.S. Naval Air Forces Atlantic Fleet, Virginia;

--U.S. Naval Air Forces Pacific Fleet, California;

--Oceana Naval Air Station, Virginia;

--Miramar Naval Air Station, California;

--Lemoore Naval Air Station, California;

--U.S.S. John F. Kennedy; and

--Operational Test and Evaluation Force (OPTEVFOR), Virginia.

We reviewed the Navy's ACLS to determine how well it works, whether the new ACLS is likely to provide improved reliability and maintainability, and the impact the new system will have on automatic landing performance.

At the locations visited, we interviewed Navy personnel to determine the causes of low completion rates for fully automatic landings with the AN/SPN-42 and to determine whether the AN/SPN-46 can reasonably be expected to address those causes. We talked to aircraft and ACLS maintenance personnel and 70 pilots assigned to the Atlantic and Pacific Fleets to determine their personal experience with the ACLS. The pilots had automatic landing experience with the A-6, A-7, F-14, or F-18 aircraft. We also reviewed available data for 1983-85 on the AN/SPN-42 system completion and availability rates. We reviewed OPTEVFOR reports on testing of the AN/SPN-46 ACLS and interviewed officials of the U.S.S. John F. Kennedy, which has on board a preproduction AN/SPN-46, about their experience with the system.

We conducted our review between January 1986 and August 1986, in accordance with generally accepted government auditing standards.

CHART I.2: BACKGROUND

ACLS is shipboard equipment for landing aircraft on carriers and includes radars, consoles, and computers.

ACLS provides for three aircraft landing modes:

--automatic hands-off landing,

--instrument approach, and

--radio talk down approach.

The Navy

--installed the first ACLS in 1962 and

--now plans to acquire a fourth version of ACLS.

Aircraft carrier landings present one of the most difficult problems faced by Navy pilots at sea. The objective of the Navy's ACLS is to reduce the difficulties of these landings by providing three landing capabilities. First, the system provides precise automatic control of landing airplanes during the final approach and landing sequence. During the carrier landing, the airplane is flying at 110 to 150 miles per hour. The completely automatic landing mode is intended for use when the pilot cannot see the carrier during the entire approach and landing sequence. Second, the system provides pilots information they can use for instrument approach from several miles out to one-half mile to the carrier. Third, the system provides air traffic controllers with information to be radioed to the pilot during a talk down landing. The Navy's current ACLS provides these capabilities.

According to Navy officials, the Navy has been using various ACLSs since 1962 and is now using its third version, an improved AN/SPN-42. The Navy wants to replace this with a fourth version, the AN/SPN-46, at a total procurement cost of $177 million. Also, Navy officials said they plan to enhance the AN/SPN-46 in the mid-1990s to incorporate higher risk technology. They estimated that it will cost an additional $48 to $50 million to develop and procure the system enhancements.

About 1,200 Navy and Marine Corps airplanes have ACLS related subsystems for automatic landings and all 1,600 carrier-based aircraft can make instrument and talk down approaches.

CHART I.3: ACLS TESTING STATUS AND ACQUISITION PLAN

Testing:

--Initial operational testing of the new system did not demonstrate that it was operationally suitable.

--Operational testing scheduled for January 1986 was deferred.

--Now operational testing is scheduled to begin in November 1986 with the test results completed by May 1987.

Acquisition:

--Navy plans to buy 25 AN/SPN-46 units.

--Navy has acquired tnree units.

--Fiscal year 1987 funds requested ($23 million) to acquire three more units early in the year.

The first of two initial operational tests recommended limited production of the AN/SPN-46 and, subsequently, in October 1985, the Navy contracted with Bell Aerospace for three SCN-funded units. In December 1985, however, a report on the results of the second initial operational test concluded that the operational suitability findings do not support a recommendation for limited production of the AN/SPN-46 ACLS.

In addition, the Navy deferred formal operational testing which was to begin in January 1986, because the SPN-46 had not been certified for use by the fleet and due to insufficient amount of at-sea test time by the U.S.S. Kennedy. Navy officials told us that operational testing is scheduled to begin in November 1986 with the test results completed by May 1987. These will be used to make a full-production decision for fiscal year 1988.

The Navy plans to award an early fiscal year 1987 limited production contract for three more AN/SPN-46s and has requested $23 million in OPN funds for that purpose. The Navy plans to purchase 25 AN/SPN-46 units.

In their comments on our briefing report, DOD officials stated that because of ship overhaul schedules, a delay in the fiscal year 1987 limited procurement of the additional three AN/SPN-46 units would cause a delay of 5 to 6 years in installation of this system on two carriers, the U.S.S. Roosevelt and the U.S.S. Saratoga. While this may be true, the delay would allow the Navy to conduct formal operational testing and to ensure the system is ready for production before any further procurements take place. In addition, the urgency of early installation of the AN/SPN-46 on these two carriers is not apparent as the U.S.S. Roosevelt, which is to be commissioned in January 1987, is equipped with a new AN/SPN-42 and the U.S.S. Saratoga has reported operational availability rates of greater than 90 percent for its AN/SPN-42 for the last 3 years. DOD officials also told us that, while the deletion of the fiscal year 1987 funds would delay installation of the AN/SPN-46 on the two carriers for 5 to 6 years, it would delay completion of the overall program by only about 1 year.

In their comments on our report, DOD officials also stated that initial operational tests demonstrated the system's potential to be operationally suitable and effective. They also stated that progress has been made in resolving discrepancies noted in these tests such as faulty power supplies. They projected that when these discrepancies are corrected the system will meet required availability. While these tests and efforts to correct discrepancies indicate its potential suitability this potential has not yet been demonstrated in formal operational tests. If the Navy procures 3 more SPN-46s, it will have about 25 percent of the sytstem in production before it determines whether the system is ready for production.

CHART I.4: COMPARISON OF ACLS WITH THE NAVY'S GOALS

	Goals for new ACLS (AN/SPN-46)	Performance of Current ACLS (AN/SPN-42)	Performance of New ACLS (AN/SPN-46)
Operational availability	92%	90%+	[a]
Mean time between failures	400 hrs.	110 hrs.	[a]
Mean time to repair	30 mins.	2 hrs.+	[a]

[a]The data collected during the initial operational testing by OPTEVFOR was insufficient to determine whether the system will meet established goals. In commenting on a draft of this report Navy officials stated that mean time to repair was satisfactory in initial operational tests. They also stated that further evaluations of operational availability and mean time between failures will be used to support the fiscal year 1987 limited production procurement. Further, they stated that a formal demonstration during shipboard operational test will be used to support the fiscal year 1988 full-production procurement.

The Navy reported to the House Appropriations Defense Subcommittee in June 1985 that the operational availability of the AN/SPN-42 system for 1983 and 1984 was 65 percent and that operational availability of the AN/SPN-46 was expected to be 92 percent. However, Atlantic and Pacific Fleet officials told us the availability of the AN/SPN-42 exceeds 90 percent and is not a problem. Our review of monthly ACLS reports verified that the ACLS availability exceeded 90 percent.

Even if the AN/SPN-46 meets the Navy's availability expectations, it may not offer a significant increase in operational availability over that provided by the AN/SPN-42. Also, the data collected in two initial operational tests conducted by the Navy's OPTEVFOR was insufficient to establish with confidence the operational availability of the AN/SPN-46.

In June 1985, the Navy told the Subcommittee that the mean time between failures and the mean time to repair for the AN/SPN-46 were expected to be 400 hours and 30 minutes, respectively, compared to 110 hours and 2 hours for the AN/SPN-42. OPTEVFOR's testing data for the AN/SPN-46 was insufficient to establish with confidence the mean time between failures or the mean time to repair for that system.

In their comments on our briefing report, the DOD officials stated that the AN/SPN-46 is being developed because the AN/SPN-42 is no longer procurable, is increasingly difficult to support, and cannot accommodate significant state-of-the-art changes without redesigning the entire system. In June 1985, however, the Navy reported to the House Appropriations Defense Subcommittee that the justification for the AN/SPN-46 was improved operational availability, mean time between failures, and mean time to repair.

In addition, DOD officials commented that our report overstated the operational availability of the AN/SPN-42, which they said was approximately 65 percent. However, these officials also told us that their figure includes availability of the system during periods when carriers are in shipyards, in port, or otherwise not in need of their ACLS. These officials had told us earlier that the operational availability rate is not supposed to include such periods. Our operational availability rate of greater than 90 percent does not include such periods and is based on extensive interviews with Atlantic and Pacific Fleet officials and ACLS maintenance personnel and a review of monthly ACLS reports filed by all carriers and air stations having the AN/SPN-42. DOD officials also commented that since 1979 the AN/SPN-42 has been identified by Atlantic and Pacific Fleet commanders as one of their 10 most problematic systems due to the low availability and support problems. Atlantic and Pacific Fleet officials told us the AN/SPN-42 is one of their problem systems because of a lack of supply support. They said they have achieved high availability rates for the system by such actions as taking needed parts from systems on ships undergoing shipyard repair.

CHART I.5: REASONS FOR LOW AUTOMATIC LANDING COMPLETION RATES

Current ACLS has low rates because of maintenance problems with ACLS-related subsystems in the aircraft.

The rates cannot be expected to improve significantly until the problems are resolved.

The completion rate for automatic carrier landings has been and continues to be low when compared to the Navy's goal of 70 percent. For 1983 and 1984 combined the Navy reported a 26 percent completion rate. For 1985, the Navy reported a 29 percent completion rate. Of the Navy's unsuccessful automatic landing attempts in 1984 and 1985, 73 percent were caused by problems in aircraft ACLS-related subsystems.

The Navy informed the Subcommittee last year that the basic cause of the low completion rates for attempted automatic landings was not the shipboard ACLS but an aircraft subsystem, the radar augmentor, used for aircraft tracking. They estimated that two upgrade programs for the radar augmentor would increase the automatic landing rate to 70 percent. However, Navy officials told us that the programs will not achieve the anticipated increase in the completion rate because other problems surfaced in the radar augmentor and other airplane subsystems.

Maintenance problems are another reason for the low landing rates. Wing personnel told us that maintenance of aircraft ACLS-related subsystems has low priority because a problem with any of these subsystems will not cause an aircraft to be grounded. In addition, they said that maintenance of aircraft ACLS-related subsystems is difficult on board a carrier for several reasons. First, although an aircraft's wings need to be fully extended to fine tune the subsystems, space for such a procedure is severely limited. Second, fine tuning of the subsystems requires many hours. For example, it was estimated that it takes 36 hours to fine tune these subsystems on an F-14. Third, maintenance of these subsystems requires the use of support equipment which is in high demand and short supply.

Therefore, replacing the current ACLS alone is not expected to significantly improve automatic carrier landing rates. Furthermore, Navy officials state that the 70 percent completion rate is possible assuming replacing the AN/SPN-42 will reduce shipboard caused problems by one-half and by improving related aircraft subsystems.

In commenting on our report, DOD officials said that in addition to the radar augmentor programs, other subsystems are being identified for upgrade or improvement and they anticipate that by fiscal year 1990, problems caused by aircraft subsystems will be reduced by two-thirds.

CHART I.6: CONCLUSIONS

--The Navy has not been able to achieve its automatic landing goal of 70 percent for ACLS.

--Problems with aircraft related subsystems are the primary cause for the low rates. These are being considered for replacement.

--The Navy does not expect the new ACLS alone to significantly improve automatic landing completion rates.

--Testing of the new ACLS has not provided enough data to determine operational availability, mean time between failures, and mean time to repair, but the Navy wants to procure three additional systems in early fiscal year 1987.

--The procurement of three more new ACLS units before successful completion of operational tests could be premature.

Problems in aircraft subsystems, rather than in the shipboard ACLS, have caused the completion rate for fully automatic landings to be only 26 to 29 percent, well below the 70 percent anticipated.

The Navy recognizes that the problem is in the aircraft subsystems and that AN/SPN-46 will not significantly improve its ability to effect automatic carrier landings and, therefore, has not justified its planned ACLS replacement on improved fully automatic landing rates. Rather, the Navy wants the AN/SPN-46 in order to improve operational availability, mean time between failures, and mean time to repair. The current system is already achieving the operational availability goals set by the Navy.

Operational testing of the AN/SPN-46 has not been completed. Preliminary tests have not provided enough data to determine whether operational availability, mean time between failures, and mean time to repair will be improved.

In summary, the Navy has contracted for three AN/SPN-46s and wants to buy three more with fiscal year 1987 funds. It may be premature to purchase additional units because the report of the most recent operational testing concluded that the AN/SPN-46 was not yet operationally suitable and therefore additional procurement was not justified.

CHART I.7: MATTER FOR CONSIDERATION BY THE CONGRESS

The Committee may want to delete fiscal year 1987 ACLS procurement funds ($23 million).

The Committee may want to delete the Navy's fiscal year 1987 OPN budget request of $23 million to acquire three new ACLSs (AN/SPN-46) because

--the report of the most recent operational testing concluded that the AN/SPN-46 was not yet operationally suitable and therefore does not support further limited production,

--formal operational testing has been delayed and achievement of system goals has not been demonstrated, and

--the new ACLS will not significantly increase the automatic landing completion rate until aircraft ACLS-related subsystems are improved.

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